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# Integrated Coastal Zone Management (ICZM) in Indonesia: A View from a Mangrove Ecologist

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**Abstract**

As an archipelagic country with 17,508 islands and more than 81,000 km of coastline, Indonesia is among the globe's richest areas in biodiversity as well as marine assets. In each island of Indonesia, there is strong competition to use coastal resources. They are used for fishing, recreation, waste disposal, power generation, water supply, coal, building material and mineral sands extraction, forestry, farming, residential and industrial purposes. All these uses are in high demand and have become a source of conflicting interests. They need to be managed properly under an Integrated Coastal Zone Management (ICZM) system. These uses are under the control of Government authorities (DKN [Dewan Kelautan Nasional], The National Oceans Council, that later become The National Maritime Council) and various different groups. Increasing pressures are being felt in the development and rationalisation of the various uses.

**Keywords:** ICZM, Indonesia, coastal resources, functions, uses, development and conflict

## Introduction

Indonesia covers a vast area, with a total territory of 3.7 million km$^2$, almost 62% of which is sea. Upon the recommendation of the United Nations Convention on the Law of the Seas (UNCLOS) 1982, Indonesia acquired jurisdiction over an Economic Exclusive Zone of some of 2.7 million km$^2$ (Table 1). Consequently, the marine assets (Oceans and Coastal resources) of Indonesia are outstanding compared to land assets.

As an archipelagic country with 17,508 islands and more than 81,000 km of coastline, the Indonesian coastline is by far potentially the largest and most important coastline in the world in terms of economic activity. It should be a major site for both ocean and coastal research in the twenty-first century.

Coastal zones are one of the major ecosystems of the Indonesia biosphere. They represent one of the important areas for biodiversity issues and new species are constantly being discovered there. Biodiversity is expressed both at the functional (species groups) and structural (community) levels and plays an important role in determining system responses to environmental change. Coastal zones represent a habitat that is intermediate between the sea, the land and fresh waters, which provides a complex and

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**Table 1** Indonesia: Some Approximate Areas

| | Area or Length | Notes |
|---|---|---|
| Indonesia territory | 5.0 million $km^2$ | |
| Territorial seas | 3.1 million $km^2$ | 62% of total area |
| Territorial land* | 1.9 million $km^2$ | |
| Enclosed marine waters | 2.7 million $km^2$ | 87% of total seas |
| Open oceans waters | 0.4 million $km^2$ | 13% of total seas |
| Continental shelf waters | 1.5 million $km^2$ | 47% of total seas |
| Estimated coastline | 80,791－81,000 km | |

Sources: [BPS 1978; Lembaga Oseanologi Nasional LIPI 1979]
* Indonesian Government Statistics on the precise land area vary, figures of 1.904, 1.944 and 2.019 have been reported by various departments.

dynamic mixture of transitional conditions, and which is never static. Within this dynamic environment, physical and chemical factors show marked variations.

Coastal zones have long been important to people in Indonesia for both economic and political reasons. They provide the inhabitants of many of the major cities and towns with their nearest glimpse of a natural habitat. Coastal resources in Indonesia have always been used by local communities on a sustainable basis to obtain food, fodder, fuelwood, shelter, and a variety of other services. With a high biological diversity and endemism, these coastal resources (living and non living) are in high demand to serve national economic development.

Now coastal resources are under pressure, either as repositories for the effluent of industrial processes and domestic waste, or as prime sites for reclamation to create land for industry or agriculture or settlement. Moreover, during the course of last century, especially in Java, large cities have continued to expand at an accelerating pace; and this growth has become enough to disturb the coastal zone. On the other hand, Indonesia's population is increasing at an alarming rate, approaching 215 million by the year 2000 [Republik Indonesia, Biro Pusat Statistik 1999]. Also, about 65% of the Indonesian people live in and around coastal areas, making the problem of managing the coastal zone in Indonesia even more complex. There is no doubt that demographic pressures are exceptionally pronounced in Indonesia.

The approach that I will describe for a rational ICZM is based on the essential resources that are used by human in Indonesia. Effective ICZM requires an understanding of how biological diversity is regulated by natural processes. In order to practise effective ICZM, planners need to understand the ways in which the natural environment and human activities are inter-connected to form a system.

## The Coastal Zone

In Indonesia, coastal ecosystems in each island strongly modulate the different en-

vironmental effects of land on ocean and vice-versa. Coastal areas have a complex environmental setting as a function of three major processes: (1) geophysical, (2) geomorphic and (3) biological. Each of these processes typically operates over a range of spatial and temporal scale, from the micro-scale to the local systems scale to the global scale. Consequently, the boundary between land and sea is physically dynamic.

Various biotic and abiotic processes in the coastal zone ecosystem affect the hydrological cycle and coastal geomorphology. The biota have a major influence on sediment supply (e. g., by the production of carbonates), on accretion processes, and biogeochemical fluxes between sea water, the atmosphere and marine sediment. The temporal and spatial scales of physical, chemical and biological processes determining the fluxes of materials into and out of the coastal zone in Indonesia extend to the landward and seaward limits of marine and terrestrial influences respectively. Definitions of the coastal zone for ICZM in Indonesia may extend the landward and seaward limits of marine and terrestrial influences respectively, so that few parts of the earth's surface are excluded. At the other extreme (for the political level at the provincial government), the coastal zone can be restricted to the coastline and adjacent geomorphological features determined by the action of the sea on the land margin.

Blessed with a warm tropical climate and high rainfall (> 1,500 mm per annum) [Schmidt and Ferguson 1951], these waters are further enriched with nutrients from land which enable them to support a wide diversity of marine life. In the biggest islands — such as Java, Sumatra, Kalimantan, Sulawesi, and Irian Jaya — there are many rivers flowing into an estuary in the coastal zone, providing an excess of water which flows through the system and out to the sea with a magnitude that will vary with the inflow and the rate of change of storage within the estuary. The coastal zone in Indonesia has some of the world's richest ecosystems, characterized by extensive mangrove forests, coral reefs and seagrass beds. The mangrove forests (some of 4.25 million hectare in extent) [Republik Indonesia, Departemen Kehutanan 1997] constituted the dominant ecosystem type in marine and brackish coastal areas, and produce a litterfall of about 20.50 to 29.35 t/ha/year of dry weight [Sukardjo 1995]. At the ecological level, the coastal zones in Indonesia contain quite large resources of other sorts of fish and invertebrates that are used lightly or not at all, such as the smaller species of shrimps, molluscs, crabs, etc. Microscopic creature (e. g., phytoplankton) in the coastal waters for the most part must be concentrated by larger animals before they can be economically harvested and used by man. It is at the second tropic layer stage, therefore, that estimation of the ocean's capabilities to produce fish or food begins to break down.

Coastal ecosystems in Indonesia are biologically and/or ecologically very productive, and support the major marine fisheries and mariculture activities. Despite the attempts of man to pollute or reclaim it, this habitat continues to offer a fascinating insight into a natural world where energy is transformed from sunlight into plant materials (mangroves, saltmarsh, seagrass, etc.). For instance, the potential net primary

production of mangrove forests in Indonesia is estimated to be about 40.40 to 45.50 kg C/ha/day [*ibid.*]. And for *Rhizophora mucronata* plantations the annual above ground net primary production was 20.80–25.00 t/ha/year [Sukardjo and Yamada 1992a]. Through the steps of a food chain, this plant material is converted into a rich food supply for birds and fishes. At this level in the food chain, animals do become importantly beneficial to man.

The interface between land and sea, the coasts in Indonesia are a unique geologic, ecological and biological domain of vital importance to an astounding array of terrestrial and aquatic life forms — including humankind. Clearly, coastal zones also represent immense natural beauty and provide unique aesthetic experiences and access to the mysterious sea.

## Coastal Zone Problems in Indonesia

Since coastal areas occupy a significant portion of Indonesia's territory (Table 1), coastal zone exploitation is closely linked with a concern for economic development. Much use is already made of the coastal resources (e. g., mangrove forest, seaweed, fish, shrimp, crabs, molluscs, etc.) for direct human consumption and other purposes. However, I know of no reasonable estimates of the actual magnitude of this use. For example, traditionally, inhabitants make extensive use of the goods of the mangrove forest for food, household uses, and medicinal applications. And no matter how much people harvested the resources, the resources were replenished by natural processes. There processes are now being reduced in scale, and thus in effectiveness, by human actions, so resources are no longer being replenished.

There is no doubt that the key resource use problems and conflicts in the ICZM in Indonesia include:

(i) Loss of mangrove forest and tidal swamps which support traditional fisheries, e.g., artisanal fisheries, silvofisheries, collecting molluscs, catching mud crabs (*Scylla serrata*),
(ii) Improper utilization of the coastal zone by non-coastal investors (e. g., large-scale conversion of mangrove forests to *tambak*, fishponds),
(iii) Declining socio-economic status and employment opportunities for inhabitants of increasingly poor coastal village communities (see Table 2),
(iv) High and increasing levels of coastal pollution,
(v) Overfishing and overexploitation of coastal resources, including the extensive use of destructive methods, such as coral reef bombing,
(vi) Insufficient understanding of the ecological importance of the coastal zone and maintenance of coastal resources on the part of developers and government

decision-makers,

(vii) The emphasis upon agricultural development (e. g., rice production) for income and food security through conversion of the coastal zone.

The consequences of coastal exploitation in Indonesia are very complex. This is primarily due to the fact that government must minimize both sectoral conflicts and constraints that work against the maintenance of those sought-after benefits. Human-induced stresses on mangrove ecosystems have produced a vicious cycle in which economic growth leads to a widening gap between the richer few and the poor majority in the country. Increasingly it is being realized that a man-induced effect on one ecosystem can have far-reaching consequences on another in unanticipated and negative ways. Erosion accelerates and site quality declines. Furthermore, increasing demand from within the provinces (27 different provinces with different levels of social welfare) themselves and from the coastal villages, along with their rapid population growth, compound the ICZM problems, which are economic, legal, institutional, social, and policy-related. All the problems are both locally embedded and coupled with regional and/or global environmental or ecological issues. Severe pressures on coastal zone often end in over-exploitation of coastal resources (see Sukardjo [1990] regarding the mangrove forests in Java). This in turn leads to faster rates of coastal degradation. Degradation and over-exploitation of land, water and other coastal resources, plus the disruption of environmental processes through degradation of environmental quality and loss of critical terrestrial and aquatic habitats, has produced serious deleterious impacts on the health and productivity of coastal ecosystems, adversely affecting the food availability, health and economic welfare of coastal people in Indonesia.

The consequences of coastal degradation are widely spread, influenced by many different human activities, and have economic, social and political repercussions [refer to *Ketetapan-Ketetapan MPR RI dan Garis Besar Haluan Negara 1993* (Act of the People's Consultative Assembly and Outlines of State Policy 1993) 1993: Pembangunan Berwawasan Lingkungan (Development with Environmental Outlook)]. An examination of the existing and potential uses of the living aquatic resources by inhabitants in different sites

**Table 2** Anthropogenic Background in the Coastal Zone for ICZM in Indonesia: A View by a Mangrove Ecologist Based on GBHN 1993 (Outlines of State Policy 1993)

| |
|---|
| 1. The importance of cultural background and sedentarization in pattern of behaviours (e. g., orang Laut, orang Bajau, orang Bugis, orang Banjar, etc.) |
| 2. Changes in land tenure in the coastal zone (e. g., for transmigration, agriculture land, settlement, etc.) |
| 3. The impact of "*paceklik*" on the economy of traditional fisheries' production system (e. g., women's fishing and fisheries development, women in fishing communities for household food security, social structure and population activities) |
| 4. The common herd economy |

reveals that there are certain trends that have traditionally supplemented or competed with the land uses, for example milkfish in the fish pond with silvofisheries method. In addition, inshore and estuarine areas generate a flow of recreational services that now provide the base for a number of important industries. It is believed that the value of coastal zone resources depends upon its location (e. g., island or province or village) and condition (e.g., ethnicity).

The interaction between natural conditions and human-modification of the coastal zone in Indonesia has been complex and complicated. For examples:

(i) Discharges from industrial and construction activities cause chemical contamination of coastal water/zone,[1)]

(ii) Storm water delivers heavy metals and other non-degradable toxic element to the coastal environment,[2)]

(iii) Relationship between mangrove forests (areas of mangrove in ha) and fisheries (yield in tons). From the physical point of view, the relationship is mainly a question of the effect of the mangrove forest areas on the coastal waters ecosystem. Therefore, it is vitally important to understand such processes if mangrove systems are to be manipulated to provide a sustainable yield of fisheries product without adversely influencing the productivity of the coastal waters, and

(iv) The role of micro-organisms (bacteria, yeasts, protozoa and fungi) in the food-web of both the coastal waters and in benthic environments in the production and degradation of particulate organic carbon and in the utilization of dissolved organic matter (DOM) needs to be quantified, because it may be central to understanding of the flux of organic carbon through marine ecosystem. For instance, flux of the woody detritus and other mangrove litter components on the floor of the mangrove forest in East Kalimantan is estimated to about 4.72 to 8.19 dry t/ha/year. [Sukardjo 1995]

Nevertheless, attempts to compile a list of the uses of the coastal zone in Indonesia lead to a dozen or more major categories. And single sector overuse of some resources has caused grave problems.

The coastal zones in most islands of Indonesia are subjected to increasing population (e. g., transmigration, resettlement, etc.) and economic pressures manifested by a

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1) For example, as to Jakarta Bay see Sukardjo and Toro [1994] and Hutagalung [1994]; as to Cimanuk delta complex see Sumatra [1982]; as to the estuaries of Tondano-Menado, Kali Wonokromo-Surabaya, Kali Porong and Bengawan Solo see Hutagalung *et al*. [1994].

2) For example, northern coast of Java, eastern coast of Sumatra, coastal zone of West Lombok, coastal zone of Timika, Irian Jaya, coastal zone of East Kalimantan.

**Table 3**　Number of Households in the Mangrove Environment of the Sulawesi Project Sites

| Activities | Kwandang, N. Sulawesi | Luwu, S. Sulawesi | Mamuju, S. Sulawesi | Muna, SE. Sulawesi | Total |
|---|---|---|---|---|---|
| Ponds | 146 | 2,684 | 421 | 130 | 3,381 |
| Wild crab, shrimp, seaweed | — | 422 | 45 | 763 | 1,230 |
| Fuelwood: own use | 540 | 1,838 | 648 | 1,684 | 4,710 |
| Fuelwood: sale | 50 | 100 | — | 394 | 544 |
| Shingles | — | 350 | 45 | — | 395 |
| Fishing | 487 | 1,501 | 329 | 693 | 3,010 |
| Total mangrove households | 4,061 | 7,152 | 2,987 | 3,178 | 17,378 |
| Total households | 6,728 | 15,261 | 8,128 | 5,217 | 35,334 |

Source: [Kulp and Baruadi 1995]

variety of coastal activities, notably, fishing, coastal aquaculture, waste disposal, salt-making, tin mining, oil drilling, tanker traffic, construction and industrialization. All are in many cases threatening ecological stability. This situation in particular cases is aggravated by the expansion economic activities attempting to upfilt the living standards of coastal peoples, the vast majority of whom live below the official poverty line (e. g., in the project sites in Sulawesi, see Table 3). Obviously, human interactions in the coastal zone in Indonesia are often a critical factor. This is an aspect that has begun to receive attention only in recent times.[3] On the other hand, unanticipated events inevitably occur: new coastal resources are discovered, new uses of the coastal zone are proposed, urgent problems and coastal resource depletion suddenly emerge. Appropriately, therefore, humans have been recognized as an integral component of the coastal ecosystem dynamics in elaborating of the strategy for ICZM in Indonesia (Table 4). ICZM is fundamentally a process, and as such it can deal on a reactive basis as well. As mangroves are the dominant coastal ecosystem, ICZM will promote community organization and participation aimed at mangroves conservation and management, both directly and indirectly. The resulting ICZM is a process designed to be as proactive as possible within the limits of the data and information available at the time the program is developed.

Because they are a source of economic benefits, the coastal zones in Indonesia teem with dense human settlements. The effect of human settlement on the ability of the coastal systems to retain their ecological stability, and their multiple use attributes for food, recreation and other human requisites, is of great importance. Furthermore, attractive coastal areas and unique small scenic spots have always existed in Indonesia. Consequently, tourism poses serious pressures on some settlements along with their agricultural lands in the coastal zones and in doing so creates development problems in Indonesia. It is evident then that the importance and vulnerability of the coastline will

3) For example, Program Pengentasan Kemiskinan (Poverty Aids Program by Government) along with IDT's Inpres Desa Tertinggal (Special Aids to Reduce Poverty in Villages).

**Table 4** Necessary Conditions and Policy Principles for the ICZM in Indonesia Based on My Own Views

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|---|
| 1. (a) Maintaining coastal environmental quality (b) Conservation of cultural (ethnic group) and biological diversity (e.g., mangrove forest) and ecological integrity |
| 2. (a) Technical and economic efficiency (b) Efficiency of coastal resources use by all societies |
| 3. Avoiding government failure |
| 4. (a) Maintainin future options (b) Maintaining political stability |
| 5. (a) Stopping population growth (b) Strong community participation in policy and practice in the process of transition to an ecologically sustainable society |
| 6. (a) Maintaining conditionally-renewable natural capital (b) Constant natural capital and sustainable income |
| 7. (a) Depleting non-renewable capital (b) Inter-generational equity: providing for today while retaining resources and options for tomorrow |
| 8. (a) Redistributing wealth to per capita-poor villages (b) Pricing environmental values and natural resources to cover full environmental and social costs |
| 9. (a) Using resources rights (e. g., traditional right, "*marga*," etc.) to create ecosystem-coupled markets (b) Resource use in manner that contributes to equity and social justice while avoiding social disruptions |
| 10. Building a sustainable economy [PELITA VI=The Sixth National Five-Year Development Plan, PJP II=The Second Long-Term (25-Year) Development Plan] |
| 11. Environment-friendly market mechanisms |

ensure that pressure will continue for its development for a variety of purposes, that roads leading to coastal areas will become increasingly incapable of dealing with traffic volumes (e. g., *angkutan pedesaan* (villages transportation) ) and that the environment will continue to deteriorate. It also means that depletion of biological diversity (e.g., mangrove forests in Java) [Sukardjo 1990] in the coastal zones in Indonesia is a human problem, apart from its ecological dimension. For example, canal-type developments (e. g., Cengkareng drain in Jakarta), coastal housing for recreation and flood mitigation are all making inroads on the coastal system, and at this stage are doing so without sufficient overall planning.

A pattern of increasing use of coastal resources in each province still yields a very impressive picture of natural resource-based economic development. But the rapid changes occurring in the near shore seas and lands in the coastal zones, if not adequately understood, will also hamper development in Indonesia. The most critical point in sustainable as enunciated in the GBHN[4)] is the generation of new employment opportunities. For Indonesia the coastal zones, therefore, offer the possibility of enabling more and more people to engage in meaningful activities (e. g., in the senses of silvofisheries, mangrove crab pen culture, work as mangrove stewards) in a development oriented society. Furthermore, maritime areas can help solve problems of unemployment and

4 ) Garis Besar Haluan Negara (Outlines of State Policy)

under-employment in Indonesia. This can be achieved, for instance, in programs of Mangrove Rehabilitation and Restoration, Silvofisheries, Ecotourisms and Community Based Mangrove Forest Management. Finally, ICZM in Indonesia is today a matter of global concern.

## ICZM: Opportunity and Interest to Ecologist

Natural biomes in the coastal zones, such as mangrove forests, coral reefs, coastal wetlands etc. are being destroyed globally. Indonesia is no exception. But deforestation has taught us a bitter lesson — we must use our natural resources in a more rational manner.

The coastal zones in Indonesia are naturally productive area which supplies a significant part of Indonesia's, and the world's, food protein. These are also important areas for amenity, recreation and wildlife conservation. In short, the coastal zones in Indonesia need to be managed as complete systems in which the many complex relations among the different environments and their interactions with local communities in each province are properly taken into account. Since the Rio Declaration on Environment and Development in 1992,[5] the international climate of thought is that the idea of development and environmental protection should not be regarded in isolation from one another. Environment and development are to be regarded as two sides of the same coin. However, in my opinion, sustainability and development are contradictory (Table 5) and are related respectively to renewable or non-renewable resources. In Indonesia, development is mostly related to both political and economic will; sustainability with moral or ethical and cultural concerns. In this regard, the ICZM development in Indonesia is mostly based on the traditional uses and rights of particular ethnic groups[6] in the coastal zones.

The coastal zones in Indonesia contain a wide array of ecological, biological, economic, and political issues, as well as cultural and moral positions. Therefore, since it is recognized that a stance affirmed by a diversity of theoretical, religious, philosophical and moral doctrines is likely to be more just and much more resilient than one based upon a single paradigm, the search is now on for some overarching consensus about the type of social and economic policies that promote sustainable forms of coastal resource uses and their investment. But economics, it must be remembered, is not the sole source of criteria by which sustainable development are maintained.

ICZM systems in Indonesia are closely related to, and dependent on, the coastal

5）See United Nations Conference on Environment and Development along with their Agenda 21.

6）For example, Hak Ulayat or Traditional Inherited Land Rights, Hak Marga or Traditional Community Land Rights, Hukum Adat or Customary Law.

**Table 5** The Ideas of Sustainability: Cronological Events for Understanding the Terms of Sustainable Development

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|---|
| 1. The phrase "Environment and Development" as the basis of Sustainable Development: |
| 1–1. UNCHE (United Nations Conference on Human Environment) 1972 |
| 1–2. WCS (World Conservation Strategy) 1980 |
| 1–3. WCED (World Commission on Environment and Development: Our Common Future) 1987 |
| 1–4. CE (Caring for the Earth: A strategy for Sustainable Living) 1991 |
| 1–5. UNCED (United Nations Conference on Environment and Development) 1992 |
| Sustainable Development (SD): Keyword of WCS, WCED and UNCED (contradictory concept) |
| Sustainable Utilization (SU): For renewable resources, e. g., fisheries, forestry, pasturing within the Earth's carrying capacity, wise and rational use |
| Sustainable Management (SM): For non renewable resources, e. g., fossil fuel saving, recycling and substitution |
| 2. Sustainability-Development (S-D) contradictory: |
| 2–1. Sustainability (S): Maintaining a desirable state of an ecosystem and productivity-appropriate technology |
| 2–2. Development (D): Changing a state to another state, to increase productivity, to bring to a more advanced or effective state, to bring out the capabilities or possibilities |

environment. They are also very vulnerable to changes in land-use, and today the sustainability of coastal resources is threatened. It is also essential to understand the coastal resource system itself. What is it? How does it function? What are the ecological relationships among resources? What degree of interference in its functioning processes can it tolerate? As a multidisciplinary approach, the ICZM requires cross-sectoral data (see Fig. 1 for the choices) regarding all aspects of the coastal zones in Indonesia, for establishing a preliminary step at the top decision makers level (inter-ministerial link) at the DKN,[7] which later became The National Maritime Council, with the President as a chairman. The implementation of an ICZM in Indonesia, will, of necessity, involve all levels of government (*pusat–daerah–kelurahan* [central–provincial–villages]), and coordinate research (e. g., LIPI, BPPT, NGOs, University) in a number of disciplines in order to devise and carry out a national coastal resources survey and to coordinate with coastal zone development. At the government level, there is need to strengthen the powers of the DKN and Department of Marine and Fisheries to act as co-ordinator for developments in coastal zones as well as regarding tropical marine resources in Indonesia. Consequently, good lines of communication are essential to successful ICZM. Giving these bodies additional responsibilities should entail the development of a set of principles (follow up to Table 4) as a basis for planning as well as for use in the training of planners and

7) Dewan Kelautan Nasional (The National Oceans Council)

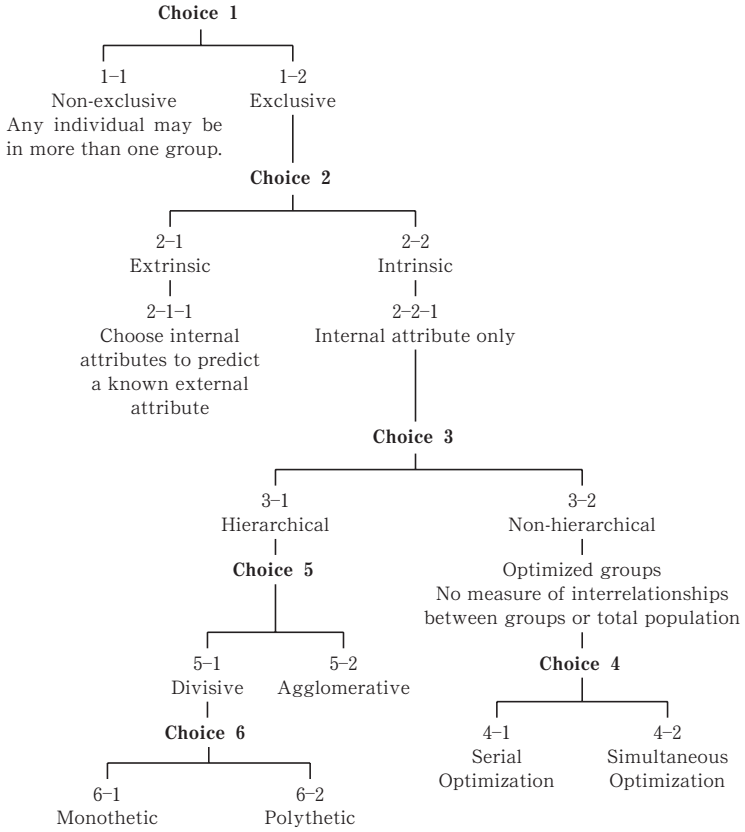


**Fig. 1**　Choice of Classification Strategies: Example Elements for ICZM

managers as part of a wide educational program on tropical marine sciences. Neither efforts to strengthen government coordination nor those to improve communication are now proceeding on an appropriate scientific basis (Table 6 ). Support for ICZM as a national tool has been provided by The Indonesia Maritime World Convension (Konvensi Benua Maritim Indonesia), held in Makassar in December 1996, and the recommendations from that convention, as well as the MASTER C (Marine Sciences and Technological Center).

In brief, planning of ICZM will consist of four major steps. These are:

( i ) Identification of the contemplated resource or use in the coastal zone,
( ii ) Estimation of the benefit anticipated, costs involved, goals, need and time schedules,
( iii ) Evaluation of technological, legal, economic, sociological and political factors,
( iv ) Implementation through funding arrangements, authorization and assignment of responsibilities for management and regulation.

**Table 6** Failure and Success in Communication: A Summary for ICZM in Indonesia with Special Reference to the Results of Puslitbang Oseanologi LIPI (A view from a Mangrove Ecologist)

| Level of Understanding Reached | Possible Reason |
|---|---|
| 1. Virtual incomprehension (apathy or hostility likely) | 1. Widely different assumptions (unrecognised) |
| | 2. Unthinking rejection of alternative views |
| | 3. Foreign or second language barrier |
| | 4. Use of highly technical words, long words, abbreviations without explanation |
| | 5. Speaking for too long, too vast, too quietly |
| | 6. "Waffling," mixing with irrelevant material |
| | 7. International "blinding" with "science" |
| | 8. Patronising and/or servile attitudes |
| | 9. Not attending |
| 2. Narrow comprehension (misunderstanding) | 1. Scope of subject not introduced |
| | 2. Easy dismissal of alternative explanations |
| | 3. Not seeing the food for the species |
| | 4. Not appreciating facts relevant to the situation |
| | 5. Not being aware of limitations |
| | 6. Inability to adapt ideas for other circumstances |
| 3. Wide comprehension (successful communication likely) | 1. Using straightforward language, and using practical examples |
| | 2. Recognising limits on present knowledge |
| | 3. Setting subject in its background |
| | 4. Recognising mutual contribution |
| | 5. Building on existing methods |
| | 6. Talking in terms of the listener's interests |

Note: Good communication need not imply that the parties agree as to the present situation or on priorities for the future.

Although the importance of coastal zone is widely recognised, the particular significance attached to them is often a matter of individual perspective. This again emphasizes the need for increased knowledge of the human dimensions of the problems, including the social structures of coastal peoples in different sites of the country. Multi-user problems are becoming increasingly acute in areas of high population density and areas containing multiple ethnic groups, as well as in those with high standards of living and advanced technology. It should be pointed out, however, that appropriate

**Table 7**　DKN (Dewan Kelautan Nasional, The National Oceans Council)
Based on the KEPPRES Republik Indonesia No. 77 tahun 1996

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| Chairman: President Republic of Indonesia |
| Vice Chairman: Menteri Koordinator Bidang Politik dan Keamanan (Minister Coordinator for Political and Security Affairs) |
| Members: 1. Menteri Dalam Negri (Minister of Home Affairs), 2. Menteri Luar Negri (Minister of Foreign Affairs), 3. Menteri Pertahanan Keamanan (Minister of Defence and Security), 4. Menteri Kehakiman (Minister of Justice), 5. Menteri Pertambangan dan Energi (Minister of Mining and Energy), 6. Menteri Pertanian (Minister of Agriculture), 7. Menteri Perhubungan (Minister of Communication), 8. Menteri Pariwisata, Pos dan Telekomunikasi (Minister of Tourism, Post and Telecommunication), 9. Menteri Pendidikan dan Kebudayaan (Minister of Education and Culture), 10. Menteri Keuangan (Minister of Finance), 11. Menteri Kesehatan (Minister of Health), 12. Menteri Negara Lingkungan Hidup (Minister of State for the Environment), 13. Menteri Negara Riset dan Teknologi/Ketua BPPT (Minister of State for Research and Technology/Chairman of the Agency for the Assessment and Application of Technology), 14. Menteri Negara Perencanaan Pembangunan Nasional/ Ketua BAPPENAS (Minister of State for National Development Planning/Chairman of the National Development Planning Agency), 15. Panglima ABRI (Commander in Chief of the Armed Forces), 16. Jaksa Agung (Attorney General), 17. Prof. DR. Mochtar Kusumaatmadja S. H, 18. DR. Hasyim Djalal. |

Source: [Sekretariat Menteri Koordinator Bidang Politik dan Keamanan Polkam 1997]

institutions are needed at national and provincial levels to promote, develop, manage and coordinate elements of the ICZM in Indonesia. At the national level The National Development Planning Agency, the State Ministry of Environment, Departments of Agriculture, Forestry, and Foreign Affairs should be involved (see Table 7). At the provincial level, the primary actors should be local governments and the Provincial Development Planning Agency office (Dinas/KanWil). National plans and program prepared by government have, in general, proved to be very satisfactory. See, for example, Action Plan for Sustainable Development of Indonesia's Marine and Coastal Resources or Biodiversity Action Plans for Indonesia.

Outline of State Policy 1993 (GBHN) determined the *sumberdaya kelautan* (marine resources, including both seas and coastal resources) to be a fundamental asset for national development in the future and a means to enhance prospects for sustainable development. This approach involves:

(i) Divergent approaches to the documentation of coastal resources,
(ii) Ways to pay for conservation (e. g., for mangrove forests in Java) [Sukardjo 1990; Sukardjo and Yamada 1992b],
(iii) Ways to distribute profit from the marketing of biotechnology (e. g., shrimp from ponds, aquaculture ponds),

(iv) Local involvement in land and forest management,[8] and
(v) Identification of a range of options in coastal land use planning.[9]

Therefore, in the next National Five-Years Development Plan (Pelita V), the Government of Indonesia has an opportunity to make significant progress towards the achievement of truly sustainable development. Clearly, ICZM can make a great contribution to the welfare of humanity at large and help to preserve the marine resources (*sumberdaya kelautan*), the most important storehouse for the future. There are various ways to develop the global network of Coastal-Marine Protected Areas and Biosphere Reserves in order to conserve and utilize the biological resources in Indonesia (e. g., oyster), and this is one of the important element of ICZM in practise. Biological diversity encompasses all species of plants, animals and micro-organisms, and the ecosystems of which they are a part. The biological richness and diversity of coastal zones in Indonesia is accompanied by a high value for its products. Marine products were evidently often traded far inland in Java some 3,000 years ago [van Bentham Jatting 1934], and they still are today in all provinces in Indonesia. Hence ICZM policy need better means for full cooperation between provinces.

The longest continuous human economic activity in the coastal zone in Indonesia would be fishing. And the fisheries statistical system for coastal fisheries should be well developed. In connection with the ICZM policy, the principal things to be kept in mind concerning the future of coastal fishery development in Indonesia, include:

(i) The nutritional value,
(ii) Highly prized fish that command a high price in markets,
(iii) The costly part of fish production is modern technology (e. g., shrimp, milkfish ponds, etc.),
(iv) The animals closest to the phytoplankton in the ecological system tend to be smaller than those in further removed trophic levels.

All are valid and important points of view. It is not surprising, then, to find that goals and strategies for the management, conservation and utilization of coastal resources are often as diverse as the reasons for which coastal zones themselves are valued. Irrespective of their goal, ICZM strategies must be based on a thorough working knowledge of the way coastal systems function, and of the factors, both natural and man-induced, which influence their stability and function.

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8) For example, prosperity approach for the MAMA and MALU projects of the Perum Perhutani (The State Forestry Corporation), mangrove stewards for the Community Based Mangrove Forest Management.
9) For example, Tata Ruang (Spatial Land-Use) by the State Ministry of Environment, Green Belt by Department of Forestry.

The scenic attractions of the coastal zones in Indonesia are considerable, and the climate is regular and benign by tropical standards. It is essential that some attempt be made to assess the area generally (elements of ICZM) to ascertain the sensitivity and delicacy of the natural systems and resources that create the attraction inherent in the area and to accommodate the number of people involved, together with their attendant services. Because of the combination of fragility of the coast and concentration of human impact, the point I wish to make is that the conservation of coastal zones, including the visual environment of such zone, should be the objective (and, indeed, the responsibility!) of developers proposing to create tourist facilities or any other type of project. In this regard, developers will act as single legal authority to change the coastal environment for other uses, e. g., ecotourism, and therefore, to run a tourism business. The prospects of how local people will respond to a program of tourist development will in turn depend on the ability of developers (e. g., coastal zone managers) to motivate and train them. The coastal zones should be recognized as an ecologically sensitive areas that have outstanding natural value for hydrological, geological, scenic, wildlife or vegetation reasons, and which should therefore be developed with great care. Also, 65% of the Indonesian population lives adjacent or very near to the coastal zones, increasing the complexity of resources management and the likelihood of coastal degradation. ICZM will help ensure conservation and sustainable development for entire coastal resources through community participation. And the peoples at the village and district levels through Local Community Organization (LCO), LKMD,[10] and LMD[11] will represent the strategic focus of activities for, by way of example, mangrove-oriented organizational formation and management. The LCO is being formed in the context of work undertaken by the NGO appointed to undertake the Social Preparation and Awareness Program (SPAP). These activities are essential. They are comprised of a socio-economic and anthropological survey as well as extension and communication activities within coastal communities at the particular sites and/or provinces. These will promote strengthening community organization in the villages aimed at mangroves conservation and management. The importance of this is indicated by the fact that revenue of coastal forestry resources in Indonesia was US$180 million in 1987 or 5% of the total forest production [Republik Indonesia, Biro Pusat Statistik 1999], and total economic value of the mangrove forests in Indonesia covering 23 provinces for the year 1996 estimated to be about Rp 820,773,189 millions. Because of limited skilled professional man-power, shiptime and finances, there is a need for strategies to select for investigation representative or critical ecosystems or habitats/areas and processes within the vast areas (especially scenic spots and mangroves) as a main input for the policy of ICZM at the top levels (e. g., DKN, Ministry of Marine and Fisheries).

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10）Lembaga Ketahanan Masyarakat Desa (Village Community Self-Reliance Council)
11）Lembaga Musyawarah Desa (Village Consultative Committee)

## Concluding Remarks

About 65% of the total population in Indonesia live in or near the coastal zones. The majority of the people in the coastal zones (e. g., within the mangrove forest areas) live in poverty, are under educated and unemployed. The crucial problem is known as *lapar lahan* (hunger for land) and myths. Communities in the coastal zones and/or mangrove environment are densely populated and ethnically mixed (e. g., in Sulawesi project sites) (Table 8 ). They are always looking for land and for food in the mangrove environment to support their life. Land tenure and resource allocation issues represent an important problem for land use, spatial planning, and forest management, and are a fundamental source of social conflict in many coastal areas in Indonesia (e. g., in the Cimanuk delta complex, West Java) [Sukardjo and Yamada 1992b].

To provide adequate supplies of food and sufficient employment in the future for the expanding population in Indonesia (from 204 million in 1999 to an estimated 276 million by the year 2020) [Republik Indonesia, Biro Pusat Statistik 1999], all of the present potential coastal resources must contribute to the general welfare in the country (e. g., fisheries, coastal ecotourism). For instance, the economic contribution of coastal tourism in Indonesia from 16 million coastal/marine tourists was US$423 million in 1987, and accounted for 50% of domestic and 68% of international visits [Republik Indonesia, Departemen Pariwisata, Pos dan Telekominikasi 1989]. Coastal systems have the capacity to

**Table 8** Ethnic Identity of Heads of Households in the Mangrove Environment of the Sulawesi Project Sites (%)

| Ethnicity | Gender | Kwandang, N. Sulawesi | Luwu, S. Sulawesi | Mamuju, S. Sulawesi | Muna, SE. Sulawesi |
|---|---|---|---|---|---|
| Bajo | M/F | –/– | –/– | –/– | 19/20 |
| Bugis | M/F | 1/– | 33/30 | 28/25 | 10/10 |
| Buton | M/F | –/– | –/– | –/– | 9/5 |
| Gorontalo | M/F | 96/95 | –/– | –/– | –/– |
| Java | M/F | 1/2 | 9/9 | –/2 | –/– |
| Kaili | M/F | –/– | –/– | 11/9 | –/– |
| Luwu | M/F | –/– | 54/56 | 4/– | –/– |
| Mamuju | M/F | –/– | –/– | 32/42 | –/– |
| Mandar | M/F | –/– | 2/3 | 16/18 | –/– |
| Muna | M/F | –/– | –/– | –/– | 61/64 |
| Sangir | M/F | 1/1 | –/– | –/– | –/– |
| Other | M/F | 1/2 | 2/2 | 9/4 | 1/1 |
| Total | M/F | 100/100 | 100/100 | 100/100 | 100/100 |

Source: [Kulp and Baruadi 1995]

support a wide range of activities. The sheer variety of activities[12] in the coastal zone is a clear reflection of the value of coastal resources to human society. Furthermore, uses of coastal resources that maximize their benefits to society as a whole often conflict with uses that provide the private land owners with the highest economic return, e. g., fishpond. Therefore, the goals of the ICZM in Indonesia, and the strategies for achieving them, will be a continuing source for debate in the years ahead (see Table 4 ).

The coastal zone in Indonesia is the region of the globe where variations in climate and sea-level and the effects of growing spectrum of human activities have the greatest environmental impacts.[13] In order to practise effective ICZM, planners need to understand the way the natural environment and human activities are interconnected to form a system. But no complete study of the earth system can be undertaken without attention to the coastal zones in different islands of the country.

The future behaviour of coastal systems in response to changes in climate and other environmental factors is of direct socio-economic importance in terms both of biological feedback effect on the global environment and of the availability and sustainability of living resources for human consumption. The success of ICZM in Indonesia will depend on a careful blending of scientific research about the functioning of coastal ecosystems, and of the factors, both natural and man-induced, which influence their stability and function. Those influences are complex (due to different locations/islands) and complicated (existence of different ethnic groups with different perceptions, social poverty etc.).

Because of the special nature and fragility of these coastal zones, where the land meets the sea, policy makers, politicians, and economists are not always aware of the social and economic complications of promoting the sustainable development of fisheries, agriculture and forestry on the coastal zones in Indonesia. Integration of fisheries (e. g., mariculture, fishpond, silvofisheries) with other forms of agriculture diversifies farm productivity, which in turn provides opportunities for intensified production with more efficient allocation of land, water, labour, equipment and other enterprises which operate independently. Sukardjo and Akhmad [1982], for example, reported that in Indramayu and Tegal, small scale farms collecting shells in the mangrove environment for the manufacture of feed for ducks, pigs and chickens; planting cash crop trees for firewood (viz, *Albizia retusa, Acacia auriculiformis, Lannea grandis, Pithecellobium dulce, Samanea saman, Zyzyphus mauritianus*), and/or growing wingbean, *Moringa oleifera, Pluchea indica, Sesbania grandiflora* as source of edible vegetables. To optimize the multiple use potential of the mangroves, for instance, a management plan was prepared which considers not only tree resources and shrimp farming but also advocates the establishment of growth centres and forest villages as one means of marshalling available human resources into ecologically viable sites, so that social services and infrastructures can be

12）For example, ecotourism, tin mining (Indonesia has 650,000 tonnes of tin placers offshore).
13）See Program Desa Pesisir (Program on Coastal Villages) as to sand mining.

provided in a cost effective manner (e. g., in the northern coast of West Java). I believe that some of the problems of planning and guiding the development of coastal zones in Indonesia along sound ecological lines are exceptionally difficult, and thus provide us with the need for a new paradigm. Consequently, we need to expand and strengthen the dialogue among natural and social scientists, managers and decision makers. In conclusion, therefore, a printed report can never give full expression to the many facets of the coastal zones in Indonesia (Tables 2 and 4), with all the adventures and challenges they pose both to man and to science. Even today, few facts are known from coastal zones, especially in hostile or remote areas of islands in Indonesia.

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**References**

Djalal, D. P. 1996. *The Geopolitics of Indonesia's Maritime Territorial Policy*. Jakarta: Center for Strategic and International Studies. 155p.

Hutagalung, H. 1994. Kandungan Logam Berat dalam Sedimen di Perairan Teluk Jakarta [The High Metal Content in the Sediment of the Jakarta Bay Waters]. In *Prosiding Seminar Pemantauan Pencemaran Laut* [Proceeding of the Seminar on the Marine Pollution Monitoring], edited by D. Setiapermana, Sulistyo and H. Hutagalung, pp. 1–6. Jakarta: Puslitbang Oseanologi LIPI.

Hutagalung, H.; Setiapermana, D.; and Sulistyo, eds. 1994. *Makalah Penunjang Seminar Pemantauan Pencemaran Laut* [Additional Papers for Seminar on the Marine Pollution Monitoring]. Jakarta: Puslitbang Oseanologi LIPI. 160p.

*Ketetapan-ketetapan MPR RI dan Garis Besar Haluan Negara 1993* [Act of the People's Consultative Assembly and Outlines of State Policy 1993]. 1993. Jakarta: CV Mini Jaya Abadi. 259p.

Kulp, L.; and Baruadi, R. 1995. Rural Sociology: Anthropology. Unpublished Documents. Department of Forestry, Republic of Indonesia. 71p.+ 3 appds.

Lembaga Oseanologi Nasional LIPI. 1979. *Rencana program penelitian dan pengembangan sumberdaya laut dan lingkungan laut di dalam Pelita III 1974–1984* [Planning Program for the Research and Development of Marine Resources and Marine Environment in the Third Five Years Development Plan 1979–1984]. Jakarta: Lembaga Oseanologi Nasional LIPI. 26p. (mimeo.)

Republik Indonesia, Biro Pusat Statistik (Central Bureau of Statistic). 1978. *Statistik Indonesia 1977* [The Statistic of Indonesia 1977]. Biro Pusat Statistik Indonesia. lxxii+ 1,202p.

————. 1999. *Statistik Indonesia* [The Statistic of Indonesia]. Biro Pusat Statistik Indonesia. xli+ 593p.

Republik Indonesia, Departemen Kehutanan(Department of Forestry). 1997. Personal Communication regarding to the hectarage of mangrove forests in Indonesia.

Republik Indonesia, Departemen Pariwisata, Pos dan Telekomunikasi (Depatment of Tourism, Post and Telecommunication). 1989. *Statistik Pariwisata* [The Tourism Statistic]. Jakarta: DitJen Pariwisata, Departemen Pariwisata, Pos dan Telekomunikasi RI. 25p.

Republik Indonesia, Departemen Penerangan (Department of Informations). 1994. *Rencana Pelita VI* 1994/1995–1998/1999. Vol. I–VII. Jakarta: Departemen Penerangan RI.

Schmidt, F. H.; and Ferguson, J. H. A. 1951. *Rainfall Types Based on Wet and Dry Period Ratios of Indonesia with Western New Guinea*. Verhandelingen No. 42. Djakarta: Kementrian Perhu-

bungan Djawatan Meteorologi dan Geofisik. 120p.
Sekretariat Menteri Koordinator Bidang Politik dan Keamanan Polkam(Secretariate of the Minister Coordinator for Political and Security Affairs). 1997. Dewan Kelautan Nasional [The National Maritime Council]. Republik Indonesia. Unpublished Document. 19p.+ix.
Sukardjo, S. 1990. Conservation of Mangrove Formation in Java. In *The Plant Diversity of Malesia*, edited by P. Baas, K. Kalkman and R. Geesink, pp. 329–340. The Netherlands: Kluwers Academic Publishers.
————. 1995. Structure, Litterfall and Net Primary Production in the Mangrove Forests in East Kalimantan. In *Vegetation Sciences in Forestry*, edited by E. O. Box, R. K. Peet, T. Masuzawa, I. Yamada, K. Fujiwara and P. F. Maycock, pp. 585–611. The Netherlands: Kluwers Academic Publishers.
Sukardjo, S.; and Akhmad, S. 1982. The Mangrove Forests of Java and Bali (Ibdobesia). *Biotrop Spec. Publ*. No. 10: 113–126.
Sukardjo, S.; and Toro, A. V. 1994. Akumulasi Cd oleh Semai *Avicennia marina* (Forsk.) Vierh. di Hutan Mangrove Pesisir Teluk Jakarta [The Accumulation of Cd in the *Avicennia marina* Seedlings in the Coastal Mangrove Forest in the Jakarta Bay]. In *Prosiding Seminar Pemantauan Pencemaran Laut*, edited by D. Setiapermana, Sulistyo and H. Hutagalung, pp. 39–44. Jakarta: Puslitbang Oseanologi LIPI.
Sukardjo, S.; and Yamada, I. 1992a. Biomass and Productivity of a *Rhizophora mucronata* Lamarck Plantation in Tritih, Central Java, Indonesia. *For. Ecol. Manage*. 49: 195–209.
————. 1992b. The Management Problems and Research Needs of the Mangrove Forest in the Cimanuk Delta Complex, Ujung Indramayu, West Java. *Southeast Asian Studies* 29 (4): 468–485.
Sumatra, I. M. 1982. Insecticides Residue Monitoring in Sediments, Water, Fish, and Mangroves at the Cimanuk Delta. *Majalah Batan* 15 (4): 18–30.
van Bentham Jatting, T. 1934. On Prehistoric Shells from Sampung Cave, Central Java. *Treubia* 14: 103–108.